ESTIMATION AND COSTING

An Introduction to Estimation

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Introduction

What is "Estimation" in Civil Engineering?

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- It is the determination of the probable cost of construction of any civil engineering structure.

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- It is prepared before the actual construction.

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What is "Estimation" in Civil Engineering?

- It is the determination of the probable cost of construction of any civil engineering structure.
- It is prepared before the actual construction.
- It broadly involves:
  1. **Analysis of the project:** Identification of each item of work (including requisite specification) involved in a project.
     Eg: Earthwork, Masonry, Concreting, Plastering, etc.
  2. **Quantification** of each item of work.
  3. **Pricing** each item of work.

Estimator

Who is an Estimator?

Estimator

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- The person who performs the job of estimation of a project is known as *Estimator*.

What shall be the abilities of an Estimator?

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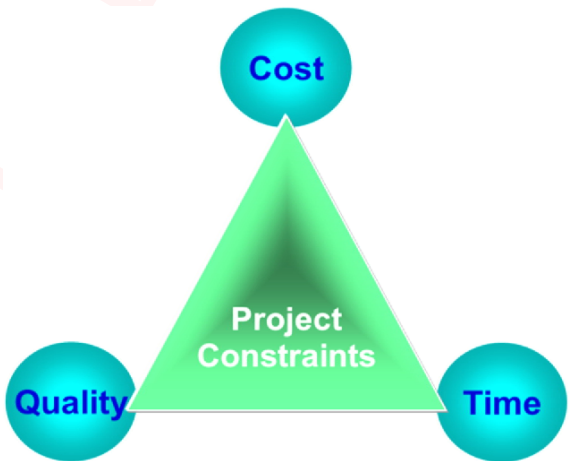
- The person who performs the job of estimation of a project is known as *Estimator*.

What shall be the abilities of an Estimator?

- He must be able to read and quantify Building Plans.
- Have good knowledge of mathematics and a keen understanding of Geometry.
- Must be able to visualize the project and foresee various items of work and all potential problems.
- Must have a good awareness of Building materials, labour, its availability and other such constraints.



Quantity Surveying

What is meant by "Quantity Surveying"?

Quantity Surveying

What is meant by "Quantity Surveying"?

- It is the determination of quantities of different items of work of a Civil Engineering project.
- The person who is responsible for preparing the estimate of quantity of different items of work is known as **Quantity Surveyor**.
  He performs the following duties:
  1. Cost estimation, cost planning and cost management of a project. (i.e., **Estimator**)
  2. Valuation of completed construction. (i.e., **Valuer**)

Purpose of Estimation

Why do we need Estimation?

Purpose of Estimation

Why do we need Estimation?

1. To ascertain the amount of money (**capital**) required to realize a project.
2. for the Government to **allocate** funds towards development of public infrastructure.
3. in order to obtain administrative and technical **sanctions**.
4. to ascertain quantities of **materials** required to program their timely procurement.
5. to calculate the number of workers (**Labour**) required to complete the work within the stipulated time.
6. to assess the requirements of **tools, equipment** as well as **machinery** required to complete the work as per schedule.

Purpose of Estimation

Why do we need Estimation?

7. to fix the **project completion period** from the volume of works involved in the estimate.
8. to **justify an investment** from the benefit-cost ratio.
9. to invite **tenders** and prepare **bills** for payment.
10. An estimation for an existing property is required for its **valuation**.

Relevant Terminologies

1. **Administrative Approval/Sanction (A/A):**
   - sanction accorded by the Government for execution of a project.
   - It is accorded to project proposals by the competent authority of the Administrative Ministry/ Department requisitioning the work.
2. **Technical Sanction (T/S):**
   - sanction accorded by the competent authority of an Engineering Department, after duely obtaining Administrative Approval.
   - A certificate that the detailed estimate has been prepared and approved on the basis of a properly detailed design.
3. **Budgeted Works:**
   - In this mode, outlay (fund for project) is provided from the financial estimates and accounts of the Union of India that are laid before and voted by both the Houses of Parliament and executed through Central Public Works Department (CPWD).
4. **Deposit Works:**
   - works of construction or repairs and maintenance, the cost of which is met out of:
     - *Government grants* to autonomous or semi-autonomous bodies or institutions through their Administrative Ministries; or
     - *Non-Government sources* such as Contributions from public etc.

Relevant Terminologies

5. **Quantity:**
   - the amount or number of a material estimated by spatial measurement.
   - expressed in Length, Area or Volume, determined by standard mensuration procedures/formula. For eg., if the material is a
     - plane surface of a rectangle, then Area = L x B (expressed in m^2)
     - solid of cuboidal shape, then Volume = L x B x H (expressed in m^3)
6. **Rate:**
   - Cost of unit quantity of an item.
     Eg: According to DSR 2021, Rate for the item: Providing and laying in position cement concrete of specified grade 1:2:4 excluding the cost of centering and shuttering - All work up to plinth level = **Rs.7365.15/m^3**

Relevant Terminologies

7. **Schedule of Rates (SOR):**
   - contains list of rates of various items of work.
   - Central Public Works Department (CPWD) publishes Schedule of Rates known as **Delhi Schedule of Rates (DSR)**.
     - DSR is based on the **prevailing market rates** of materials in **Delhi** as on a specific date.
     - The labour rates adopted are as per **minimum wages** applicable with effect from a date notified by Govt. of Delhi/ Govt. of India, whichever is higher.
     - The technical sanctioning authority may decide rates of **non-schedule items** judiciously based on market rates without adding cost index.

Relevant Terminologies

7 Schedule of Rates (SOR):

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Vol. 1

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Note: For Sub Heads 1 to 12 refer to Vol. 1

DSR 2021 Contents

Relevant Terminologies

7 Schedule of Rates (SOR):

4.0 CONCRETE WORK

Code No.	Description	Unit	Rate ₹
	CEMENT CONCRETE (CAST IN SITU)		
4.1	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level :		
4.1.2	1:1½:3 (1 Cement: 1½ coarse sand (zone-III) derived from natural sources : 3 graded stone aggregate 20 mm nominal size derived from natural sources)	cum	7783.65
4.1.2A	**1:1.5:3 (1 Cement: 1.5 coarse sand (zone-III) including manufactured sand derived from Recycled Concrete Aggregate (RCA) upto 25% : 3 graded stone aggregate 20 mm nominal size including Recycled Concrete Aggregate (RCA) upto 25%).**	**cum**	**7555.05**
4.1.3	**1:2:4 (1 cement : 2 coarse sand (zone-III) derived from natural sources : 4 graded stone aggregate 20 mm nominal size derived from natural sources)**	**cum**	**7365.15**

Inside of DSR 2021

Relevant Terminologies

8. **Analysis of Rates:**
   - forms the basis for arriving at a correct rate per unit quantity of an item of work listed in the SOR.
   - **Delhi Analysis of Rates (DAR)** incorporates all the analysis of items of Delhi Schedule of Rates (DSR).
   - It explains how the rate of an item is worked out. The rate of an item includes:
     i. Cost of Materials
     ii. Cost of Conveyance of Materials to worksite
     iii. Cost of Labour
     iv. Cost of Tools/Equipments/Machinery
     v. Cost of Sundries (i.e., various items not important enough to be mentioned individually)
     vi. Miscellaneous Levies (or Add-on Costs)
   - The sum of costs from (i) to (v) is known as **Bare Rate**.

See the example shown in the next slide

Relevant Terminologies

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level :

4.1.2 1:1½:3 (1 Cement: 1½ coarse sand (zone-III) derived from natural sources : 3 graded stone aggregate 20 mm nominal size derived from natural sources)

Code	Description	Unit	Quantity	Rate ₹	Amount ₹	
	Details of cost for 1 cum.					
	MATERIAL					
0295	Stone Aggregate (Single size) : 20 mm nominal size	cum	0.57	1400.00	798.00	
0297	Stone Aggregate (Single size) : 10 mm nominal size	cum	0.28	1350.00	378.00	
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	163.93	139.34	
0982	Coarse sand (zone III)	cum	0.425	1500.00	637.50	
2203	Carriage of Coarse sand	cum	0.425	163.93	69.67	
0367	Portland Cement (0.2833 cum)	tonne	0.40	5000.00	2000.00	
2209	Carriage of Cement	tonne	0.40	145.72	58.29	
	LABOUR					
0155	Mason (average)	day	0.10	749.00	74.90	
0114	Beldar	day	1.63	645.00	1051.35	
0101	Bhisti	day	0.70	714.00	499.80	
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with hooper	day	0.07	800.00	56.00	
0012	Vibrator(Needle type 40mm)	day	0.07	350.00	24.50	
9999	Sundries	L.S.	14.30	2.12	30.32	
	TOTAL				5817.66	W
	Add 1 % Water charges on "W"				58.18	
	TOTAL				5875.84	X
	Add GST on "X" (multiplying factor 0.1405)				825.56	
	TOTAL				6701.40	Y
	Add 15% CPOH on "Y"				1005.21	
	TOTAL				7706.61	Z
	Add Cess @ 1% on "Z"				77.07	
	Cost of 1 cum.				7783.67	
	Say				7783.65	

From DAR 2021

Material

Labour

Tools/Machinery

Sundries

Add-on Costs

Relevant Terminologies

8. **Analysis of Rates:**

"Miscellaneous Levies" or **"Add-on Costs"** comprise:

i. Water Charges
   - For drinking purpose of the workers and for the work.

ii. Goods & Service Tax (GST)
   - A comprehensive indirect tax applied to goods and services in India.

iii. Contractor's Profit & Over Heads (CP&OH)
   - to account for:
     a) Cost of Tools/Machinery not included in the Schedule of Quantities.
     b) Cost of providing cleaner environment at site &labour welfare facilities.
     c) Cost of Quality Assurance - setting up testing lab, testing charges etc.
     d) Cost of Office set up including engagement of necessary staff.
     e) Any expenditure incurred on Earnest Money Deposit/ Performance Guarantee/ Security Deposit.

iv. Labour Cess
   - It is Building & Other Construction Workers' Welfare (BOCWW) Cess, meant to provide health and welfare measures for the workers engaged in building and other construction works.

Relevant Terminologies

8. **Analysis of Rates:**

According to DAR2021, "Miscellaneous Levies" or "Add-on Costs" are adopted as:

i. Water Charges
   - applied @ **1%** of Bare Rate

ii. Goods & Service Tax (GST)
   - applied @ 18% of Gross Rate.
   - In other words, GST component is determined by multiplying a factor **0.2127** to (Bare Rate + Water charges)

   {NB: See next slide for derivation of this multiplying factor.}

iii. Contractor's Profit & Over Heads (CP&OH)
   - applied @ **15%** [i.e., Contractor's Profit @ 7.5 % + Contractor's Overhead @ 7.5%] of (Bare Rate + Water charges + GST)

iv. Labour Cess
   - applied @ **1%** of (Bare Rate + Water charges + GST + CP&OH)

Relevant Terminologies

8 Analysis of Rates:

The Multiplying factor '*f*' for inclusion of GST component in the rates of items is determined as follows:

Bare Rate of item	**(assume)**	**Rs. 100.00**
Water charge @ 1%	0.01 x 100	Rs. 1.00
$\Longrightarrow$	**Total**	**Rs. 101.00**
Let, GST @ 18% on Gross Rate (assuming a factor f)	fx101.00	Rs. 101.00f —(a)
$\Longrightarrow$	**Total**	Rs. 101.00+101.00f **Rs. 101.00(1+f)**
CP&OH @ 15%	0.15 x 101.00(1+f)	Rs. 15.15(1+f)
$\Longrightarrow$	**Total (Gross Rate)**	**Rs. 116.15(1+f)** —(b)
Gross Rate excluding GST	$\frac{116.15(1+f)}{1.18}$	Rs. 98.43(1+f) —(c)
$\Longrightarrow$ **GST amount**	**(b)–(c)**	**Rs. 17.72(1+f)** —(d)
From (a), GST obtained		Rs. 101.00f —(e)

Equating (d) and (e), we get:
17.72 (1+f) = 101.00f
$\Longrightarrow$ **f = 0.2127**
$\Longrightarrow$ **The multiplying factor corresponding to 18% GST = 0.2127**

'

Relevant Terminologies

9. **Cost Index:**
   - It refers to an index which measures the changes in the cost for production factors in housing construction, i.e., materials, labour, equipment, conveyance, etc.
   - It measures the **relative change** in the cost of construction with **location** and **time**.
   - an indicator of the average cost movement over time of a **fixed basket** of **representative goods and services** related to Construction Industry.

Relevant Terminologies

9. **Cost Index:**
   - The rate of an item as on a specific date of an year at a specific location may be known to us (deduced from Local Market). This year is called **Base Year**.
   - Cost Index helps to determine the rate of the same item for a **different year** at a **different location**.
   - Cost Index for any particular date of any year is **derived** w.r.t **Base Year**.

Relevant Terminologies

9. **Cost Index:**
   - Cost Index is generally expressed in **Percentage (%)**.
   - Therefore, Cost Index for any year w.r.t Base Year $= \pm$ 100

Example

Consider the statement: **"The cost index for DSR 2018 is 118 with reference to DPAR 2012."**

- That is, in Delhi, SOR is prepared in 2018 based on the rates of 2012 (Base Year) and further applied a Cost Index of 118 on rates of 2012.
- Hence, Cost Index of 2018 w.r.t 2012 = 118
  ($\implies$ DSR 2018 is expressed as **DSR 2018 of Base 118**)
- Also, Cost Index of 2012 w.r.t 2012 = 100
  ($\implies$ DPAR 2012 is expressed as **DPAR 2012 of Base 100**)
- This means that, the cost of items of work at Delhi increased by 118–100 = 18% in 2018 w.r.t its cost in 2012.
- Therefore, if Rate of RCC work in 2012 = Rs.5000/m^3, then its rate changes to:

Relevant Terminologies

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- Hence, Cost Index of 2018 w.r.t 2012 = 118
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- Also, Cost Index of 2012 w.r.t 2012 = 100
  ($\implies$ DPAR 2012 is expressed as **DPAR 2012 of Base 100**)
- This means that, the cost of items of work at Delhi increased by 118–100 = 18% in 2018 w.r.t its cost in 2012.
- Therefore, if Rate of RCC work in 2012 = Rs.5000/m^3, then its rate changes to:Rs.5000 x $\frac{118}{100}$ = **Rs. 5900**

Relevant Terminologies

9. **Cost Index:**
   - Therefore, we can generalize,

Rate of an item at a desired location at the desired time

$$= \text{Rate of the item at Delhi at Base Year x } \left(\frac{Cost\ Index\ w.r.t\ Base\ Year}{100}\right)$$

Relevant Terminologies

9. **Cost Index:**
   - Generally, **Rate of an item of work at any instant is directly proportional to its Cost Index.**
   - Therefore, rates of an item of work for two different instances or years X and Y are related by the expression:

Relation

$$\frac{Rate\ for\ year\ X}{Rate\ for\ year\ Y} = \frac{Cost\ Index\ for\ year\ X}{Cost\ Index\ for\ year\ Y}$$

Relevant Terminologies

9. **Cost Index:**

Example

"Determine the rate of RCC work at Trivandrum in 2021, using DSR 2018 (Base 118 over DPAR 2012), if the Cost Index for 2021 on DSR 2018 is 135.59 for Trivandrum and the rate of RCC work as per DSR 2018 is Rs. 5900."

Relevant Terminologies

9. **Cost Index:**

Example

"Determine the rate of RCC work at Trivandrum in 2021, using DSR 2018 (Base 118 over DPAR 2012), if the Cost Index for 2021 on DSR 2018 is 135.59 for Trivandrum and the rate of RCC work as per DSR 2018 is Rs. 5900."

- Given: Base year = 2012
  Rate of RCCwork for 2018 at Delhi = Rs. 5900
  Cost Index for 2021 w.r.t Base year = 135.59
  Cost Index for 2018 w.r.t Base year = 118

Relevant Terminologies

9. **Cost Index:**

Example

"Determine the rate of RCC work at Trivandrum in 2021, using DSR 2018 (Base 118 over DPAR 2012), if the Cost Index for 2021 on DSR 2018 is 135.59 for Trivandrum and the rate of RCC work as per DSR 2018 is Rs. 5900."

- Given: Base year = 2012
  Rate of RCCwork for 2018 at Delhi = Rs. 5900
  Cost Index for 2021 w.r.t Base year = 135.59
  Cost Index for 2018 w.r.t Base year = 118
- We know,
  $$\frac{Rate\ for\ 2021}{Rate\ for\ 2018} = \frac{Cost\ Index\ for\ 2021}{Cost\ Index\ for\ 2018}$$
  $$\implies \frac{Rate\ for\ 2021}{5900} = \frac{135.59}{118}$$
  $\implies$ Rate for 2021 at Trivandrum = **Rs. 6779.50**

Relevant Terminologies

9. **Cost Index:**
Cost Index adopted by Kerala PWD on **DPAR 2019** and **DSR 2018** for various **districts of Kerala**, as on **15/08/2021**

Sl.No	Location	Cost Index with respect to DPAR 2012	Cost Index with respect to DPAR 2019	Cost Index to be applied in DSR 2018
		With base 100		With base 118
A	B	C	D	E
1	Trivandrum	160	135	135.59
2	Pathanamthitta	162	138	137.29
3	Kottayam	161	137	136.44
4	Kollam	163	139	138.14
5	Alleppy	167	138	141.53
6	Munnar	165	137	139.83
7	Idukki	167	138	141.53
8	Ernakulam	160	135	135.59
9	Calicut	161	135	136.44

Relevant Terminologies

9. **Cost Index:**

The procedure of determination of Cost Index as per PAR 2021 is explained in the next slides. (OPTIONAL!!!)

Relevant Terminologies

9 Cost Index:

Rates @ Delhi in 2021

Basket Items | Bare Rates | Net Bare Rates of Basket Items | Rates at desired location at the desired time

S.No	Description	Unit	%age Weightage of Components (x)	Rates as on 01.04.2021 (in ₹) (y)	Proportionate value (in ₹) (x) x (y) = (z)	Weightage rates (in ₹) Sum (z) = (a)	Weightage Weightage of Basket Items (w)	Rates at the time of revision of Cost Index (b)	Cost Index (b x w) a
1	Bricks (Fly Ash)	1000 nos.	100%	4500.00	4500	4500.00	8.00	-	-
2	Cement (OPC)	qtl.	100%	500.00	500.00	500.00	14.50	-	-
3	TMT Steel Reinforcement bar								
a.	8 & 10 mm dia	qtl.	50%	4900.00	2450.00	4900.00	19.50	-	-
b.	12 & 16 mm dia		50%	4900.00	2450.00			-	-
4	Aggregates 20 mm a) Natural sources	cum	75%	1400.00	1050.00	1289.25	6.50	-	-
	b) Aggregates 20 mm (RCA)		25%	957.00	239.25			-	-
5 (a)	Sand (coarse sand) Natural sources	cum	75%	1500.00	1125.00	1310.25	3.00	-	-
(b)	Sand (coarse sand) RA		25%	741.00	185.25			-	-
6	Flooring Items								
a.	Vitrified tiles	sqm	50%	560.00	280.00	732.00	5.00	-	-
b.	Ceramic tiles		20%	300.00	60.00			-	-
c.	Kota stone		10%	320.00	32.00			-	-
d.	Granite stone		20%	1800.00	360.00			-	-
7	Paints								
a.	Synthetic enamel paint	litre	33.33%	175.00	58.33	138.32	3.00	-	-
b.	Acrylic washable distemper		33.33%	40.00	13.33			-	-
c.	Premium acrylic paint		33.33%	200.00	66.66			-	-

Relevant Terminologies

9 Cost Index:

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Basket Items | Bare Rates | Net Bare Rates of Basket Items | Rates at desired location at the desired time

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8	Door / windows-wooden / uPVC / aluminum / steel								
a.	35 mm thick flush door shutters both side commercial veneering	sqm	30.00%	1000.00	300.00	2085.00	7.00	-	-
b.	Factory made, standard Z-section steel windows		15.00%	1750.00	262.50				
c.	uPVC windows		20.00%	3500.00	700			-	-
d.	Aluminum window		35.00%	2350.00	822.50			-	-
9	Pipes								
a.	15 mm GI pipes	metre	10.00%	95.00	9.50	307.50	2.50		
b.	100 mm CI pipes		40.00%	650.00	260.00				
c.	20 mm clack conduits		20.00%	70.00	14.00				
d.	20 mm CPVC pipes		30.00%	80.00	24.00				

Relevant Terminologies

9 Cost Index:

Rates @ Delhi in 2021

Basket Items | Bare Rates | Net Bare Rates of Basket Items | Rates at desired location at the desired time

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10	Lamps & Fans								
a.	Ceiling fans 1200 mm(Five Star)	each	50%	1590.00	795.00	1060.00	4.50		
b.	1200 mm LED tube lights with fittings		40%	640.00	256.00				
c.	LED bulbs9/11 W		10%	90.00	9.00				
11	Electrical machinery, Motor 7.5 HP (pump set) 1500 RPM	each	100%	23010.00	23010.00	23010.00	2.50		
12	Wires & cables								
a.	Copper wire 1.5 sqmm	100 metre	70%	1335.00	934.50	1888.50	4.00		
b.	Copper wire 4.0 sqmm		30%	3180.00	954.00				
13	Labour								
a.	Skilled	each	50%	784.00	392.00	714.50	20.00		
b.	Unskilled		50%	645.00	322.50				
						Total	100.00		

Net Cost Index

Relevant Terminologies

9. **Cost Index:**
   Cost Index on DPAR 2021 for **Delhi** as on **01/10/2022**

भारत सरकार
Govt. of India
केन्द्रीय लोक निर्माण विभाग
CENTRAL PUBLIC WORKS DEPARTMENT
सं0 डीजी/लागत सूचकांक/07
No. DG/Cost Index/07

NIRMAN BHAWAN, NEW DELHI DATED : 16/11/2022

कार्यालय ज्ञापन
OFFICE MEMORANDUM

विशय: कुर्सी क्षेत्रफल दर 01.04.2021 आधार 100 के संदर्भ में 01.10.2022 को दिल्ली का भवन लागत सूचकांक ।

Subject: Building Cost Index of Delhi as on 01.10.2022 with reference to Plinth Area Rates 01/04/2021 as base 100.

The Building Cost Index over plinth area rates (PAR) 2021 for Delhi is approved as **107** as on 01.10.2022 with base 100 as on 01.04.2021.

This issues with the approval of CE, CSQ (Civil).

16.11.2022
(एस.एन जायसवाल)
कार्यपालक अभियन्ता (टास)

Relevant Terminologies

10. **Contingencies:**
    - refers to the **incidental expenses** of **miscellaneous** character which cannot be classified under any distinct item sub-head, yet pertain to the work as a whole.
    - To meet such unforeseen expenses an additional amount of **3**% to **5**% of the estimated cost of the works is provided in the total estimate.
11. **Work charged Establishment charges:**
    - includes charges incurred for **temporary** employment of the establishment/staff for execution or immediate technical supervision, guard etc in connection with the **specific work**.
    - employed on monthly basis /temporary basis for a limited period according to the progress of work.
    - Every payment made to a member of the work charged establishment whether on account of his wages or actual travelling expenses is **charged to the work estimate** on which they are employed. For such work charged establishment an amount of **1.5**% **to 2**% of the estimated cost of the works is provided in the estimate.

Types of Estimates

According to Kerala PWD Manual (Revised in 2012), Estimates are broadly classified as follows:

Types of Estimates

According to Kerala PWD Manual (Revised in 2012), Estimates are broadly classified as follows:

1. Preliminary Estimate / Approximate Estimate / Rough Cost Estimate
2. Detailed Estimate
3. Recast Estimate
4. Working Estimate
5. Supplementary Estimate
6. Revised Estimate

1) Preliminary / Approximate / Rough Cost Estimate

Definition:

1) Preliminary / Approximate / Rough Cost Estimate

Definition:

- prepared after preliminary investigation of the construction site.
- without detailed surveying, design or drawings.
- prepared in a short period of time.

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Purpose:

1) Preliminary / Approximate / Rough Cost Estimate

Definition:

- prepared after preliminary investigation of the construction site.
- without detailed surveying, design or drawings.
- prepared in a short period of time.

Purpose:

1. to investigate the feasibility (**Financial viability**)
2. for quick decision on the proposed project, **without expending time and effort** on preparing detailed survey, design, drawings and reports.
3. for submitting to the Government or responsible authority for **Administrative sanction**.
4. for **cost comparison** between different alternatives of the same project, during planning phase.
5. for assessment of **tax** and **insurance**, approximate estimates aid in determination of value of the property.

1) Preliminary / Approximate / Rough Cost Estimate

Methods of Estimation by approximation:

1) Preliminary / Approximate / Rough Cost Estimate

Methods of Estimation by approximation:

1. Plinth area method
2. Cubic content method
3. Approximate quantities with bill method
4. Service unit method
5. Bay method

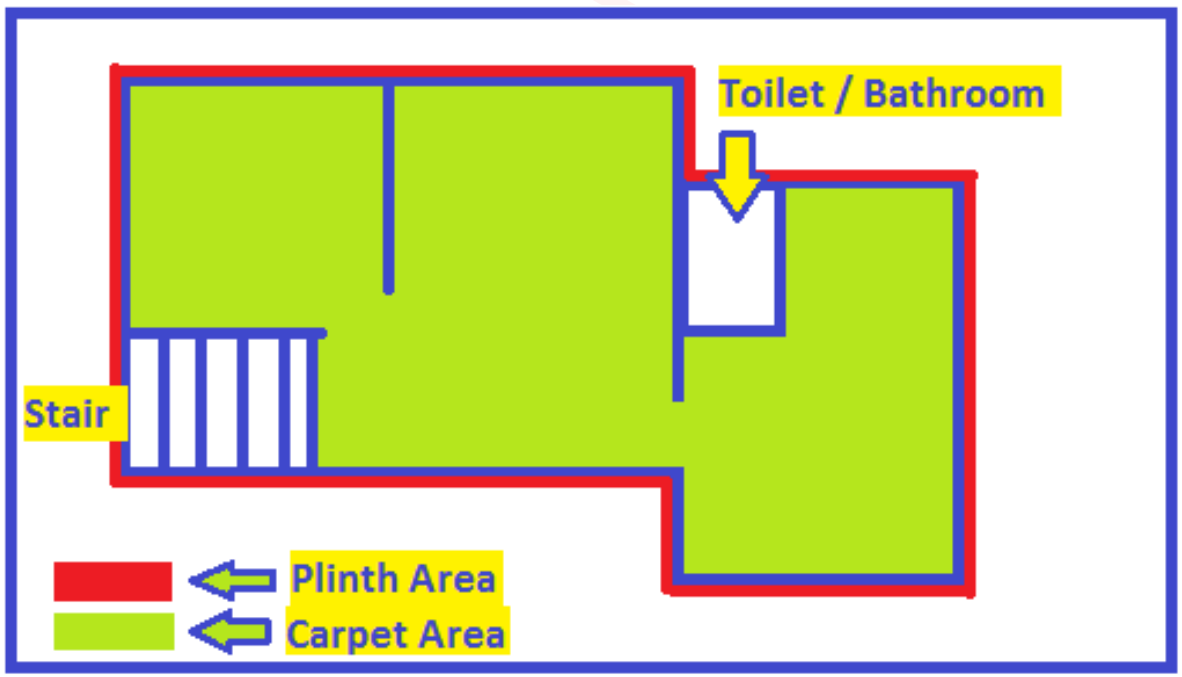
1) Preliminary / Approximate / Rough Cost Estimate

(i)Plinth area method

1) Preliminary / Approximate / Rough Cost Estimate

(i)Plinth area method

1. Estimated Cost of building
   = Total Plinth Area of the building x Plinth Area Rate
2. **Plinth Area** is the builtup covered area, measured at the floor level of any storey of the building (see fig).
3. **Total Plinth Area** is sum of Plinth area at all floors of the building.(As per IS 3861)

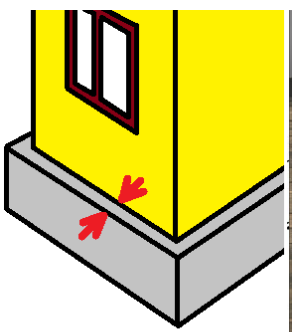


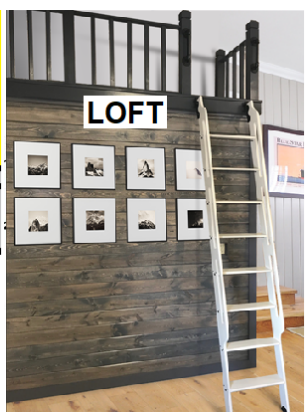
1) Preliminary / Approximate / Rough Cost Estimate

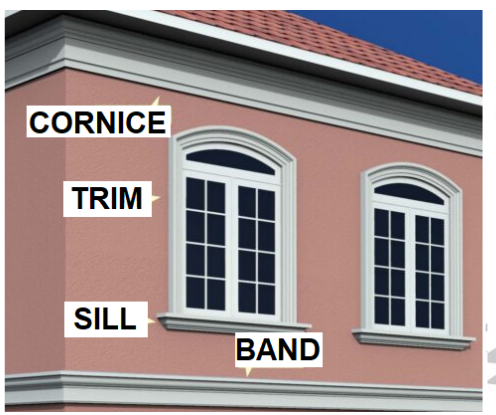
(i)Plinth area method

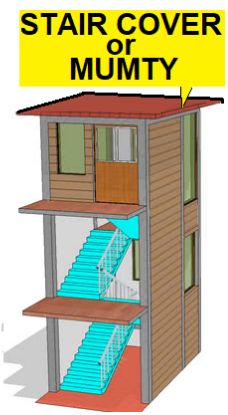
The following shall not be included in the plinth area

- Plinth projection $\leq$ 58mm;
- Loft;
- Architectural band and cornice;
- Vertical sun breaker or box louver projecting out and other architectural features, for example slab projection for flower pot, etc;
- Terrace;
- Open spiral/service staircases; and
- Mumty, machine room, towers, domes projecting above terrace level.









1) Preliminary / Approximate / Rough Cost Estimate

(i)Plinth area method

Plinth Area Rate (PAR) is regularly published by CPWD, as shown.

PLINTH AREA RATES AS ON 01.04.2019 ANNEXURE – 1

Sl. No.	Description	Non-Residential Buildings		Residential Buildings
		Office/School /College	Hospital	Hostels/Quarters (Type- I to Type-VI Qtrs.) & Bunglows (Type-VII & VIII)
		(Rates in Rupees Per Sqm.)		
1.0	**BUILDING COST (Specifications as per Annexure-II)**			
1.1	**RCC FRAMED STRUCTURE (Upto Six Storeys)**			
1.1.1	Floor ht. 3.60 m.	25500	26800	-
1.1.2	Floor ht. 2.90 m.	-	-	19500
1.2	**LOAD BEARING STRUCTURE (Upto Four Storeys)**			
1.2.1	Floor ht. 3.60 m.	21700	22800	
1.2.2	Floor ht. 2.90 m.	-	-	16600
1.3	**EXTRA FOR**			
1.3.1	Extra for every additional storey over six storeys upto twelve storeys (For RCC Framed Structure only)	580		

Delhi PAR 2019

Sl. No.	Description	Non-Residential Buildings			Residential Buildings	
		Office & College	Hospitals	Schools	Hostels	(Type- I to Type-VIII Qtrs.)
2.0	**SERVICES**					
2.1	Internal Water Supply & Sanitary Installations	4%	10%	5%	12% with attached toilets, 8% with common toilets.	9%
2.2	External Service connections					
2.2.1	Electrical External Service Connections	3.75%	3.75%	3.75%	3.75%	3.75%

1) Preliminary / Approximate / Rough Cost Estimate

(i)Plinth area method

The Plinth Area Rate published by CPWD is applicable to Delhi and for a specific date. It shall be multiplied by the appropriate **Cost Index** of the desired location and desired date (see fig, published by Kerala PWD).

Sl.No	Location	Cost Index with respect to DPAR 2012	Cost Index with respect to DPAR 2019	Cost Index to be applied in DSR 2018
		With base 100		With base 118
A	B	C	D	E
1	Trivandrum	160	135	135.59
2	Pathanamthitta	162	138	137.29
3	Kottayam	161	137	136.44
4	Kollam	163	139	138.14
5	Alleppy	167	138	141.53
6	Munnar	165	137	139.83
7	Idukki	167	138	141.53
8	Ernakulam	160	135	135.59
9	Calicut	161	135	136.44

Cost Index published by Kerala PWD as on 15/08/2021

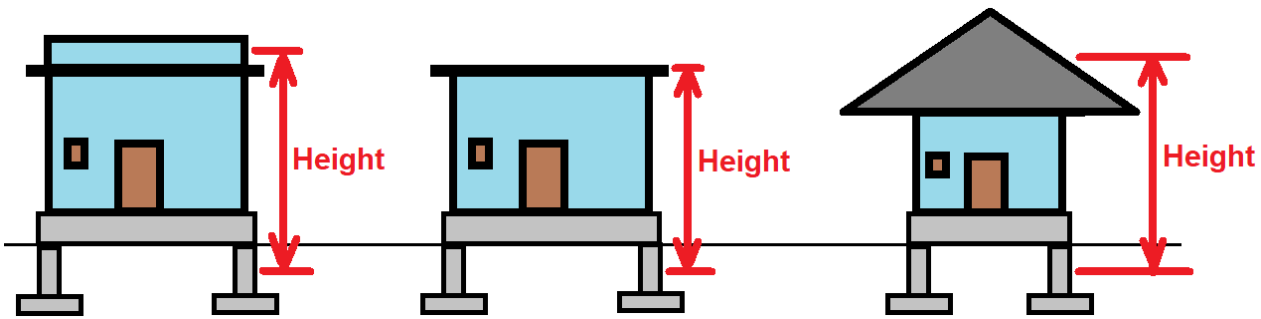
1) Preliminary / Approximate / Rough Cost Estimate

(ii)Cubic Content method

1) Preliminary / Approximate / Rough Cost Estimate

(ii)Cubic Content method

1. Estimated Cost of the building
   = Volume of the proposed building x Present Rate per cubic volume
2. **Volume of the building**
   = Length x Breadth x Height, of the building
   = Plinth Area x Height of building
3. **Length** & **Breadth** are measured above Plinth level
4. **Height** of the building is measured from *"half the depth of foundation"* to the *"top of the roof slab/ half of the top parapet wall/half height of sloped roof"* (see fig).
5. **Present Rate per cubic volume** is determined from valuation of similar building in the locality.



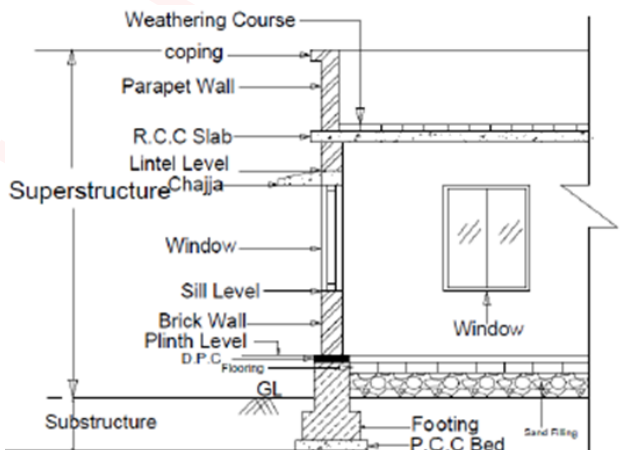
1) Preliminary / Approximate / Rough Cost Estimate

(iii)Approximate Quantities with Bill method

1) Preliminary / Approximate / Rough Cost Estimate

(iii)Approximate Quantities with Bill method

1. Estimated Cost of the building
   = Total length of walls x Cost per metre length of wall
2. **Total length of walls** of building can be worked out from its plan (in running metres).
3. **Cost per metre length** of wall may be obtained from cost evaluation of wall of a similar building in the locality.
   - A section of the wall of a building includes all items from superstructure to substructure.
   - Therefore, cost of construction of wall shall include costs of earthwork, masonry works, concreting works, finishing works, etc. computed for 1m length.



1) Preliminary / Approximate / Rough Cost Estimate

(iv)Service unit method or **Unit Rate Method**

1) Preliminary / Approximate / Rough Cost Estimate

(iv)Service unit method or Unit Rate Method

1. A *Service Unit* refers to the most important unit in a structure or a unit quantity.
2. A structure shall comprise a number of service units.
3. Example of Service unit for different structures is given below.

Structure	Service Unit
School	Classroom
Hospital	Bed
Hotel	Room
Hostel	Students
Watertank	Litre
Pavement	Kilometre

4. Estimated Cost of the building
   = Cost of a service unit x Number of service units in the building
   - **Cost of a service unit** may be worked out independently or from a similar structure in the locality.

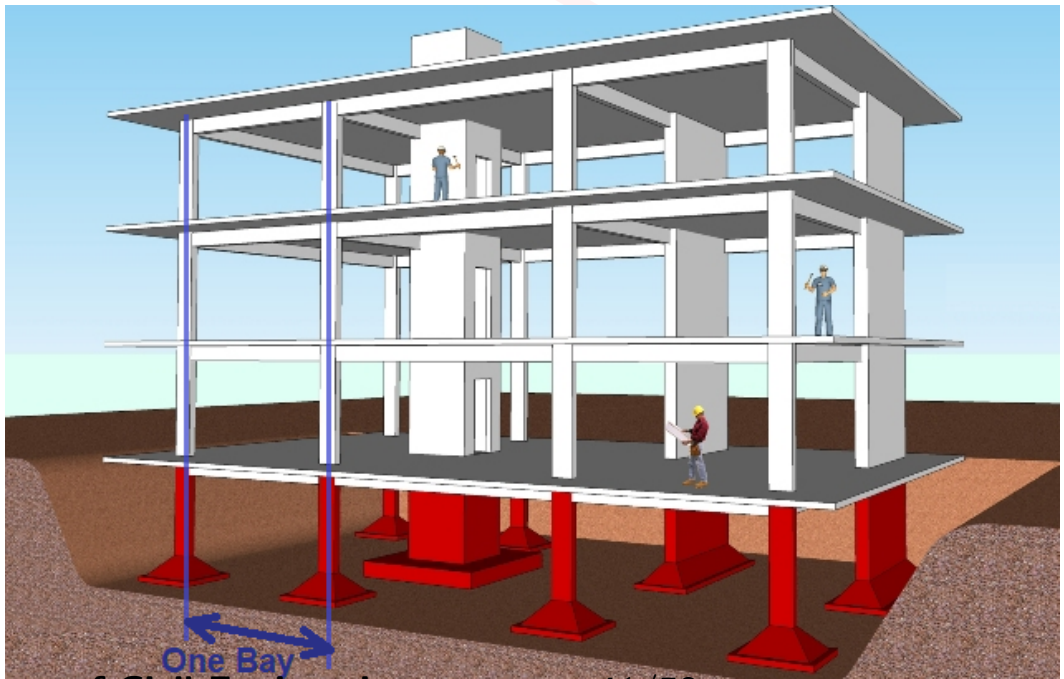
1) Preliminary / Approximate / Rough Cost Estimate

(v)Bay method

1) Preliminary / Approximate / Rough Cost Estimate

(v)Bay method

1. This method is useful for **framed structures** consisting of a number of similar bays, as for eg., industrial buildings.
2. A bay is a space between the centres of two successive columns.
3. A typical interior bay is selected and its total cost (from substructure to superstructure) is worked out.
4. Estimated cost of the building
   = Numbers of bays x Cost of one bay



2) Detailed Estimate

Definition:

2) Detailed Estimate

Definition:

- It is the complete and comprehensive estimate of a work, in which all items are individually quantified and the cost estimated.
- based on the rates given in the **Schedule of Rates** for those items covered by it and on **Market Rates** for the remaining items,
- supported by **detailed drawings** and **specifications**.

Purpose:

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- It is the complete and comprehensive estimate of a work, in which all items are individually quantified and the cost estimated.
- based on the rates given in the **Schedule of Rates** for those items covered by it and on **Market Rates** for the remaining items,
- supported by **detailed drawings** and **specifications**.

Purpose:

- to obtain the most accurate estimate of project cost.
- for submission to the Engineering Department for Technical Sanction.
- to have a clear knowledge of the quantity and technical specification of materials, machinery and labour.
- for preparation of bid/tender documents.

2) Detailed Estimate

Procedure for preparation of Detailed Estimate:

1. **Prior to the preparation:**
   - Detailed estimate for the work is to be prepared only after the receipt of **Administrative Approval**.
   - The availability of an **encumbrance-free site** shall be assured by the client.
   - **Detailed investigation of the site** by the concerned authority.
   - All **requirements** of the client, site conditions and the nature of work must be taken into consideration.
   - the T/S authority forwards to the Design Dept/ Architectural Unit all relevant structural and service data, for **preparation of detailed working drawings** and **architectural specifications** for the work.
   - Upon **receipt** of the detailed working drawings and architectural specifications, the T/S authority takes up the preparation of the detailed estimate.

2) Detailed Estimate

Procedure for preparation of Detailed Estimate:

2. **Steps in preparation:**
   - All items relevant to the work shall be **identified** from detailed architectural drawings, preliminary structural plans, preliminary lay-out drawings of the various services, detailed drawings and/or specifications etc.
   - Each item of the project should be broken down into its parts and its **quantities** worked out using standard procedures/formula of mensuration, in terms of running metres, area or volume.

DETAILS OF MEASUREMENTS CPWD- 2

Name of Work.....

Details of Work/Item/Locaton	No.	Measurements			Quantities
		L	B	H	

2) Detailed Estimate

Procedure for preparation of Detailed Estimate:

2 Steps in preparation:

- The quantity thus obtained is multiplied by the rate (per unit quantity) of the respective item, to obtain the **total cost** of the item.
- Rates used for estimation are adopted as follows:
  - **Delhi Schedule of Rates (DSR)**– published and revised by CPWD - contains all relevant items of work. Rates shall be enhanced using the **Cost Index** relevant to the location and time.
  - **Local Market Rate (LMR)**– for all items not available in DSR - duly approved by the Engineering Department. Rates shall never be enhanced using **Cost Index**.

ABSTRACT OF COST - ORIGINAL ESTIMATE CPWD- 3

State ..... Division .....

Branch..... Sub-Division .....

Name of work.....

Item No.	Sub-head and items of work	Quantity or No.	Rate		Per	Amount		Total	
			Rs.	P.		Rs.	P.	Rs.	P.

2) Detailed Estimate

Procedure for preparation of Detailed Estimate:

2. **Steps in preparation:**
   Detailed estimate shall contain the following:
   - The **justification** for the work, salient features of the proposal, and its total cost.
   - The extent of **land acquisition** and any special problems regarding execution of the work.
   - The approximate **time** required for completion and a detailed realistic programme chart for execution.
   - The **economic aspects** of the scheme, i.e., the cost as compared with benefits derived.
   - Building Plans, Service Plans, Location Plans and Structural designs of Works, including all **detailed drawings** and **specifications**.
   - Details of **quantities** of different items of work involved.
   - An **abstract** giving the description of the different items involved and the total quantities, the unit rate and the cost of each item.
   - As far as possible **Lump Sum** (L/S) provisions shall be avoided in a detailed estimate except for petty items the total of which shall not exceed **5**% of the estimate.

3) Working Estimate

- gives the details of the works and the cost thereof, which are to be carried out against a **L/S provisions** made in an estimate.
- Therefore, the working estimate **shall not exceed** the amount of **L/S provision** of the **original estimate** for the main work.
- If, however, it is not possible to limit the cost of the works included in the working estimate to the L/S provisions, care shall be taken when sanctioning the working estimate, by ensuring that the overall excess is within the powers of the authority sanctioning the working estimate.

4) Supplementary Estimate

- It is an original estimate for the **additional works** consequent on the development or extension of a project or work under execution.
- **Administrative approval** shall therefore be obtained for the supplementary estimate from the same authority, which sanctioned the original estimate, even if the cost can be met from savings in the original estimate.

5) Revised Estimate

- A revised estimate must be prepared and got sanctioned under any of the following circumstances:
  a. When there are **deletions, additions or alterations** to the scope of the work as originally sanctioned needing **revised administrative sanction**.
  b. When there are **major structural alterations** from the design as originally sanctioned.
  c. When the cost of a work is likely to **exceed** by more than **5% of T/S amount**.
- The revised estimate shall **not be kept waiting** till the work is completed or reaches an advanced stage of completion; but shall be prepared and got sanctioned as soon as any of the above conditions are anticipated during the course of execution of work.
- It shall consist of the following:
  i. A **variation statement** indicating briefly the nature and reasons for the main variation and the financial effect of the variations.
  ii. A **comparative statement** giving a comparison of quantities, rates and amount of the items between original estimate and revised estimate with the reasons for the variation of each item.

5) Revised Estimate

Comparative Statement:

ABSTRACT OF ORIGINAL AND REVISED ESTIMATES CPWD- 4

Name of work.....

Sub-heads of estimate and items of work	Original estimate				Revised Estimate				Difference	Explanations for difference
	Quan-tity	Rate Rs.	Per	Cost Rs.	Quan-tity	Rate Rs.	Per	Cost Rs.		

6) Recast Estimate

- It may sometimes happen that after the estimate for a work has been technically sanctioned, but **before it is taken up for execution**, some changes are found necessary in the estimate for the work.
- In such cases a **fresh estimate** may by prepared and got sanctioned after cancellation of the originally sanctioned estimate. This fresh estimate is called a Recast estimate and is dealt with as if it is an original estimate.

THANK YOU